Artificial Insemination and Disease Control

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SEVERAL livestock diseases are spread either partly or exclusively by contact during breeding. For these, the authors point out, artificial insemination offers an excellent method of control.

THE TECHNIQUE of artificial insemination is not new, but only in recent years has it been used on a large scale. Considerable use has been made of it in the Union of Soviet Socialist Republics and other countries. In the United States there is wide interest in the subject; much research is under way, new techniques are being developed, old ones are being improved, and it seems probable that the use of artificial insemination will continue to increase. The most extensive development in the use of artificial insemination in this country has been with dairy cattle; large numbers of cows are now bred to bulls maintained at central points. In March 1941 the number of cows recorded in cooperative artificial-breeding associations for dairy cattle was 70,751, and 237 bulls were being used.[2] The technique has also been used, less extensively, with beef cattle, horses, sheep, goats, swine, poultry, and fur-bearing animals.

The basic reason for developing artificial insemination has been to increase the usefulness of outstanding sires. There are other advantages of the technique over natural breeding, however, one being that it aids in controlling certain diseases. Many diseases that attack the reproductive organs and glands of animals may be spread by sexual intercourse, and some are transmitted only in this way. Artificial insemination can be used to prevent the spread of a disease from one female to another through the male. If improperly practiced,

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[2] U. S. BUREAU OF DAIRY INDUSTRY. COOPERATIVE DAIRY-CATTLE BREEDING ASSOCIATION. Dairy Herd-Improvement Assoc. Letter 17 (3), 29 pp. 1941. [Proposed.]

however, it may be the means of spreading diseases. Most cooperatives obtain the services of a veterinarian for this work, which requires not only a knowledge of the symptoms of diseases but recognition of the necessity for cleanliness, sanitation, and the proper disinfection of utensils before and after use.

Usually in collecting semen from the male, a rubber artificial vagina is used into which the penis is directed when he mounts the female. The semen is collected in a small tube attached to the opposite end of the artificial vagina. There are other methods of collection, but in most cases this is the best for use with mammals. In inseminating the female, a lighted speculum is inserted into the vagina. This illuminates the cervix, into which the semen is injected by means of a long tube attached to a syringe. The technique of collection and insemination in poultry differs from that in mammals because of anatomical differences in the genital tracts. Techniques for both mammals and poultry are described in detail by Lambert and McKenzie.[3]

Semen samples collected from the male in the artificial vagina are subject to contamination with germs or bacteria, just as is milk drawn from the udder. Bacteria in semen may come either from the reproductive organs of the male or from the apparatus used for collection. When the males are healthy, the bacteria are generally harmless to females, but occasionally there may be pus-producing organisms that, if present in excessively large numbers, may temporarily affect the female organs. By such measures as the provision of sanitary surroundings, regular grooming, and the use of sterile apparatus for collecting, the bacteria in semen from healthy males can be kept down to a very low number, and under such circumstances most types of bacteria do not materially affect fertilizing and keeping qualities.

The male may communicate diseases to the female either mechanically, by carrying the infective organisms from one female to another during mating, or as a result of infection in the reproductive organs. When the disease is communicated mechanically, the infecting organisms are found in the sheath and on the outer surface of the penis. Such cases are especially dangerous, because to all outward appearances the males are healthy and would not be suspected of carrying infection. When the genital organs of the male are actually infected, the organisms are transmitted in the semen, not mechanically. In chronic infections, noticeable swellings may be visible, or the health of the animal may be impaired, and usually his breeding efficiency is greatly reduced or lost. In the early stages of a disease, however, though no impairment of health may be noticeable, the disease-producing organisms may be transferred in the semen to the female.

In most cases of reproductive disorders males contract the disease through sexual contact with infected females; hence the importance of sanitary precautions to prevent the mechanical transfer of infection from one female to another by the instruments, even when the male is absolutely free of disease. It is essential that all instruments be thoroughly cleaned and disinfected after their use on each indi-

[3] LAMBERT, W. V., and MCKENZIE, FRED F. ARTIFICIAL INSEMINATION IN LIVESTOCK BREEDING. U. S. Dept. Agr. Cir. 567, 68 pp., illus. 1940.

vidual. Chemical disinfectants are generally used for this purpose and may be recommended for all equipment that does not come in direct contact with the semen. As sperm is quickly killed on coming in contact with disinfectants, other means of sterilizing equipment for handling semen must be used. Boiling and sterilization by live steam are the most desirable methods of preparing the applicators and syringes, and sufficient sterile equipment should be provided for each day's work. If only one applicator is available, it should be sterilized before it is used again.

DISEASES THAT MAY BE CONTROLLED THROUGH ARTIFICIAL INSEMINATION

If only males known to be free from disease are selected for semen collection, artificial insemination can play an important part in controlling diseases spread through sexual contact. Among the diseases in this group are granular vaginitis, a disease caused by the organism *Vibrio fetus*, trichomoniasis, navel ill, dourine, brucellosis, coital exanthema, and vent gleet of poultry.

Granular vaginitis is usually a chronic infection of cattle in which the lining of the vagina is attacked by the disease-producing agent. This results in inflammation and the formation of small pustules, which develop a granular appearance. The discharge from an affected cow contains the virus. The external genitals of a bull serving such a cow become contaminated, and he may transmit the disease to other cows in mating.

Vibrio fetus is a micro-organism found at times in the uterus and fetal membranes of pregnant cows and ewes and in the stomach of the fetus. It often causes abortion. It is believed that males may spread the disease during sexual intercourse.

Trichomoniasis is an infection of the genital tract of cows caused by a microparasite. In the female the parasite lodges first in the vagina, where it sets up an irritation and causes a discharge. It may later invade the uterus and cause sterility or abortion during the early stages of pregnancy. It is a true venereal disease transmitted by the male to the female, or vice versa, during mating.

The common condition known as navel ill occurring in foals is produced by a number of different germs. In one type of the disease the sire, in breeding, may transmit the germ to the mare, and the germ then becomes localized in the mare's genital tract. The foal may become infected in the uterus of the dam before birth or outside the uterus at the time of birth.

Dourine, a disease of horses, is similar in many respects to syphilis of man. Stallions become infected from sexual contact with infected mares and spread the disease to other mares. Dourine has been eradicated from most portions of the United States and by the spring of 1942 existed in only a few isolated localities.

Brucellosis of cattle, or Bang's disease, is a disease of the genital organs in both the cow and the bull. It is caused by a germ that is found in vast numbers in the discharge from the uterus of an infected

dam following abortion. The bull may become infected in serving an infected cow shortly after she has aborted. In some instances it is possible that the bull, harboring the germs in his seminal fluid, may transmit the disease directly or indirectly to the cow, but the disease is usually spread in other ways.

In brucellosis of swine, which is similar to the disease in cattle, the germ often becomes localized in the testicles of the boar and is discharged in the seminal fluid. It is possible that sows may become infected in breeding and that boars may become infected when serving infected sows.

Coital exanthema of horses is a venereal disease affecting the external genitalia of mares and stallions. It is transmitted from one sex to the other at breeding time.

In poultry, vent gleet and possibly several other diseases may be spread by the male to the female during sexual intercourse.

Other diseases, such as tuberculosis, may affect the genital organs of male and female animals, but there is no proof of their transmission from one to the other in mating.

The extent to which many diseases are spread through contact during breeding is yet to be determined, but artificial insemination can play a very important part in controlling the diseases which may be spread in this manner. If only healthy sires are used, if sanitary precautions are followed, and if the procedure is entrusted to the care of a qualified and careful practitioner, artificial insemination will break the link in the transmission of genital diseases.